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Test 1033: Case 770 Manual Diesel

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NEBRASKA TRACTOR TEST 1033 – CASE 770 MANUAL DIESEL

POWER TAKE-OFF PERFORMANCE

	Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
	56.36	1900	3.645	0.448	15.46	193	51	74	28.963
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
	49.50	1962	3.230	0.452	15.33	190	53	77	.....
	0.00	2084	1.069	.....	.....	183	50	74	.....
	25.43	2018	2.113	0.576	12.04	188	51	76	.....
	56.79	1901	3.659	0.446	15.52	195	51	76	.....
	12.85	2040	1.650	0.890	7.79	182	50	73	.....
	37.64	1989	2.654	0.489	14.18	189	51	75	.....
Av	**30.37**	**1999**	**2.396**	**0.547**	**12.68**	**188**	**51**	**75**	**28.953**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool-ing med	Air wet bulb	Air dry bulb	Barom-eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear (4 Lo)											
49.18	4048	4.56	1898	5.39	3.726	0.525	13.20	177	30	32	29.125
75% of Pull at Maximum Power—Ten Hours—4th Gear (4 Lo)											
39.83	3118	4.79	1962	3.72	3.084	0.536	12.92	182	44	51	28.913
50% of Pull at Maximum Power—Two Hours—4th Gear (4 Lo)											
27.82	2121	4.92	1994	2.70	2.531	0.630	10.99	181	30	31	29.240
MAXIMUM POWER WITH BALLAST											
45.92	7623	2.26	1913	14.86	2nd Gear (2nd Lo)			185	26	29	29.230
50.06	5486	3.42	1900	7.65	3rd Gear (3rd Lo)			185	28	30	29.230
50.47	4153	4.56	1899	5.29	4th Gear (4th Lo)			186	27	28	29.230
49.28	3321	5.56	1902	4.34	5th Gear (1st Hi)			188	27	29	29.230
47.80	2254	7.95	1905	2.94	6th Gear (2nd Hi)			190	25	27	29.230
43.48	1455	11.21	1899	2.37	7th Gear (3rd Hi)			188	25	27	29.230
39.64	1010	14.72	1902	1.36	8th Gear (4th Hi)			185	25	27	29.220
MAXIMUM PULL WITHOUT BALLAST											
40.58	6526	2.33	1959	14.79	2nd Gear (2nd Lo)			185	40	45	28.760

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST
4th Gear (4th Lo)

Pounds Pull	4153	4590	4828	4929	4766	4651
Horsepower	50.47	49.92	46.63	41.40	34.37	28.05
Crankshaft speed rpm	1899	1712	1526	1331	1139	951
Miles per hour	4.56	4.08	3.62	3.15	2.70	2.26
Slip of drivers, %	5.29	5.96	6.49	6.75	6.49	6.22

TIRES, BALLAST and WEIGHT		**With Ballast**	**Without Ballast**
Rear tires	—No, size, ply & psi	Two 16.9-34; 8; 16	Two 16.9-34; 8; 16
Ballast	—Liquid	858 lb each	None
	Cast iron	None	None
Front tires	—No, size, ply & psi	Two 7.5L-15; 6; 36	Two 7.5L-15; 6; 36
Ballast	—Liquid	None	None
	Cast iron	28 lb each	None
Height of drawbar		16 inches	16 inches
Static weight with operator—Rear		8180 lb	6465 lb
	Front	2640 lb	2585 lb
	Total	10820 lb	9050 lb

Department of Agricultural Engineering

Dates of Test: November 11 to November 22, 1969

Manufacturer: J. I. CASE COMPANY, RACINE, WISCONSIN

FUEL, OIL and TIME Fuel No 2 diesel **Cetane No** 52.2 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8323 **Weight per gallon** 6.929 lb **Oil** SAE 20-20W **API service classification** MS, DS **To motor** 2.213 gal **Drained from motor** 2.109 gal **Transmission and final-drive lubricant** Case TCH oil **Total time engine was operated** 41 hours.

ENGINE Make Case Diesel **Type** 4 cylinder vertical **Serial No** 2306538 **Crankshaft mounted** lengthwise **Rated rpm** 1900 **Bore and stroke** 4 1/8" x 5" **Compression ratio** 16.5 to 1 **Displacement** 267 cu in **Cranking system** 12 volt electric (two 12-volt batteries) **Lubrication** pressure **Air cleaner** dry type with replaceable treated paper element with pre-cleaner **Oil filter** full flow replaceabel cartridge **Fuel filter** replaceable primary and secondary filter carrtidges **Muffler** was used **Cooling medium temperature control** Thermostat.

CHASSIS Type standard **Serial No** 8652067 **Tread width** rear 60" to 88" front 60" to 88" **Wheel base** 102" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 29.3" Vertical distance above roadway 37.1" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** first 1.9 second 2.8 third 3.9 fourth 4.8 fifth 6.0 sixth 8.5 seventh 12 eighth 15 reverse 2.4 and 7.6 **Clutch** single plate dry dsic operated by foot pedal **Brakes** dry double disc hydraulically power actuated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 137" left 137" (on concrete surface without brake) right 177" left 177" **Turning space diameter** (on concrete surface with brake applied) right 286" left 286" (on concrete surface without brake) right 356" left 356" **Belt pulley** 1108 rpm at 1900 engine rpm diam 10.5" face 7.25" **Belt speed** 3045 fpm **Power take-off** 538 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1033.

L. F. LARSEN
Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
D. E. LANE
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power [illegible] speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**